PHILIP MORRIS U. S. A.

INTER-OFFICE CORRESPONDENCE

Richmond, Virginia

To: Dr. K. S. Houghton Date: October 14, 1992

From: Sherry Baldwin

Subject: **Paper Technology Update for the Weeks of September 7 through October 5**

Wood Pulp Papers

Analytical data from the pyrolysis of wood pulps and papers were reviewed with representatives of National Renewable Energy Laboratories. Based on prior experience in the pyrolysis of various biomass components, Dr. Robert Evans identified mass spectral peaks associated with the pyrolysis of xylans and lignins for further evaluation by Philip Morris workers. The mass spectral data generated to date comparing flax and wood pulp papers were reassessed to determine whether or not the differences observed are related to the pyrolytic products of these key components. Chemical analyses performed earlier on a variety of hardwood and softwood pulps and on flax pulps showed differences in the amount of xylans present in the wood pulps versus flax pulp. GC-MS results for the pyrolysis of wood and flax papers were analyzed for two particular mass fragments that are characteristic of xylan and lignin pyrolysis products. The wood paper yielded a much larger peak for the xylan product than the flax paper, as expected from the hemicellulose compositions of the pulps. Chemical analysis of wood pulp and flax pulp papers are in progress at the University of Maine.

Initial pyrolysis GC-mass spectral results of flax and wood pulp papers also indicate the presence of sulfur compounds in the pyrolyzate of wood pulp papers. These compounds were not detected in the pyrolyzate of flax papers. These compounds appear to arise from sulfonated lignin compounds present in the wood pulp. While this information is preliminary, these data indicate the need to investigate sulfur-free pulping processes. The first pulp samples have been prepared at the University of Maine by the soda-anthraquinone and soda-oxygen pulping processes. After subjecting these samples to a chlorine dioxide bleaching sequence, they will be shipped to Philip Morris for analysis.

The performance of wood pulp papers at Cabarrus has been monitored for the last three months. Because Kimberly-Clark uses only one source of softwood (that produced by K-C's Terrace Bay Mill), the evaluation of Kimberly-Clark's wood pulp papers on Cabarrus' J row was recommended as a follow-up study after earlier complaints about machining problems. Although the earlier problems were related to blend rather than paper, further investigation into the recurring factory complaints about wood pulp papers seemed warranted. As reported by Cabarrus QA personnel, the K-C wood pulp papers ran better than the Ecusta papers. Ecusta, however, after evaluating process monitoring data at the request of PM, made some process changes which appear to have improved the performance of their wood pulp papers.

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Ecusta has indicated that the changes made were relatively minor. The performance of wood pulp papers in our factories will continue to be monitored.

Two experimental wood pulp papers were made in a mill trial at Kimberly-Clark in late August. One sheet contains 100% hardwood as the fiber component; the other sheet, 100% softwood. Both papers were made with 30% calcium carbonate filler. Cigarettes were made for analytical and subjective smoking evaluations against flax and standard wood pulp paper controls. Descriptive Panel evaluations were completed for three Marlboro KS models to assess a 100% hardwood and a 100% softwood paper relative to the flax control paper. Both wood pulp models received negative attribute ratings relative to the flax control model. In a comparison of the two wood pulp models, no preference was found for either the hardwood or the softwood model.

Cigarette Paper Specifications

Analytical evaluation was completed on samples of DeMauduit 10-705-A cigarette paper made to targets of 26% and 30% chalk. The papers were analyzed to contain 25.9% and 28.9% chalk, respectively. Marlboro KS cigarettes made with these papers were selected for weight, ventilation, and RTD and smoked analytically in CTSD and QA. In both cases, cigarettes with the higher chalk paper delivered 0.5mg less tar and had a slightly lower puff count average than cigarettes with lower chalk paper. The impact of calcium carbonate on tar delivery for full flavor brands seems to be well established. The standard deviation was smaller for the selected cigarettes at the 30% chalk level (.42 versus .60 at 26% chalk). This observation was made in earlier evaluations as well, but those numbers are not significantly different from each other based on the small sample population.

Machinability trials were run at the Manufacturing Center using Kimberly-Clark cigarette papers ranging in tensile strength from about 0.05 to 0.13 kg/mm width. Three bobbins each of seven different types of paper were scheduled to be run on a Protos maker at 10,000 cigarettes per minute. As expected, some difficulty was encountered in running the papers of lower tensile strengths (.05 to .06 kg/mm). One box of 4,000 cigarettes was obtained for each successfully run bobbin for quality inspections. Samples of paper from each bobbin will be evaluated for tensile strength, elongation, chalk content, porosity, basis weight, and citrate level. Further evaluation of the results is in progress.

A model relating the FTC tar delivery and puff count of full flavor, low tar, and ultra low tar cigarette designs to four paper parameters -- permeability, citrate level, calcium carbonate content, and basis weight -- was developed by the Applied Statistics group. The model will be used to develop paper specifications for a minimum number of papers to replace the six grades currently used.

Banded Papers

Laboratory procedures are under development for the evaluation of banded cigarette wrappers. Methods are under development for the determination of the paper permeability within the region of the band. Other methods will be developed for determining basis weight and uniformity within the banded region using the Ambertec Formation Tester scheduled to arrive next month. A method was also developed by the Analytical Research Division to determine the level of carboxymethylcellulose (CMC) in the powders. Avicel CL-611.

For the measurement of within-band permeability, a modified Greiner instrument has been developed. A modified test clamp with a 4 mm by 16 mm test area was fabricated for the Greiner instrument to facilitate measuring the permeability within coated bands. In an initial assessment of the new clamp, the time for 50 ml of air to flow through a coated band was found to be about ten times as long as for the uncoated paper. Calibration of the instrument is in progress with a range of paper permeabilities. The precision of the measurements is also being determined.

Samples of cigarette paper printed with three levels of Avicel were submitted for analysis of propyl paraben to determine the uniformity of application level within bobbins. Avicel was printed on Grade 137-1 cigarette paper in 6.5mm bands at levels of 6.2%, 4.7%, and 3.0%. Each bobbin was sampled at 50, 400, 800, 1200, 1600, and 2100 meters. Within-band permeability measurements will be obtained on these samples, as well, once the new method has been validated.

Further analytical needs for banded papers were reviewed with the Analytical Research Division. A series of paper samples with different base paper permeability and different application levels of Avicel were provided for initial evaluations.

Based on the evaluation of cigarette prototypes prepared with banded papers with different application levels of Avicel, it appears that some control of the burn rate in the banded region can be achieved by varying the application level in the band. Only a limited number of prototypes have been prepared, so it should be noted that the process needs considerable refinement. The development work in this area is proceeding.

Batches of bleached aspen wood pulp, eucalyptus wood pulp and fine cut cellulose fiber were subjected to steam-explosion treatment at Virginia Tech. The conditions used were 200° C, 230 p.s.i., and 2.5 minutes residence time. A batch of aspen was also processed at a longer resonance time. The suitability of these materials for use on the moving orifice device will be evaluated this week. For now residence time can be varied, but 230 p.s.i. is the maximum feasible boiler pressure for the steam-explosion gun. In the next several months an upgraded boiler will be installed at Virginia Tech which should accommodate pressures in excess of 400 p.s.i.

Reduced Sidestream

Calcium Carbonate Papers

Cigarettes were made in Semiworks with papers coated with potassium phosphate solutions buffered to a pH of 3. Cigarettes were also prepared from papers having a permeability of about four Coresta before coating and a 40 g/m² basis weight for the base sheet. The objective of these paper modifications is to improve sidestream reduction compared to those used for recent consumer research.

Magnesium Carbonate Papers

Aqueous non-sol-gel

Papers will be produced at the University of Maine next week utilizing the fifty pounds of aqueous non-sol-gel material prepared by the Chemical Research Division. The papers to be prepared will have a basis weight of 45 g/m² , a filler composition of 15% of the hydromagnesite/brucite co-precipitated material along with 15% Multifex MM as a co-filler. The target porosity of one sheet will be 5 Coresta units. That of the second sheet will be 8 Coresta units. Control papers made with Multifex mm chalk will also be prepared with matching porosities as well as basis weight and total filler loading. A procedure for determination of calcium and magnesium in paper utilizing a dual EDTA titration will be used to monitor the filler levels as the papers are prepared.

SDB/cbw

cc:

C. Altizer	B. Ferguson	H. Lanzillotti
G. Bokelman	P. Gauvin	J. Myracle
T. Callaham	B. Geiszler	K. Newman
R. Cox	B. Goodman	J. Seeman
R. Comes	H. Grubbs	H. Spielberg
M. Cruise	B. Handy	S. Tafur
C. Ellis	R. Heretick	J. Whidby
B. Fenner	C. Lilly	

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